

CLAIMS

1        1. A method for simulating film grain in an image block of  $M \times N$  pixels, where  
2         $N$  and  $M$  are integers greater than zero, comprising the steps of:

3                computing the average of the pixel values within the block of  $M \times N$  pixels;

4                selecting a film grain block of  $M \times N$  pixels from among a pool of previously  
5        established blocks containing film grain as a function of the average value of the image  
6        block and a random number; and

7                blending each pixel in the selected film grain block with a corresponding pixel in the  
8        image block.

1        2. The method according to claim 1 further including the step of accessing a  
2        look up table containing random numbers to obtain the random number.

1        3. The method according to claim 2 further comprising the step of populating  
2        the look-up table in advance of film grain simulation with random numbers generated by a  
3        random number generator.

4. A method for creating a block of  $M \times N$  pixels with film grain, where  $N$  and  
M are integers greater than zero, comprising the steps of:

      receiving film grain information that includes at least one parameter that specifies an  
attribute of the film grain to appear in the block;

      creating a block of  $M \times N$  random values selected from a previously established list  
of Gaussian random numbers;

      computing an Discrete Cosine Transform of the  $M \times N$  block of random numbers;

      filtering the  $M \times N$  coefficients resulting from the Discrete Cosine Transform by at  
least one parameter in the received film grain information;

      computing an Inverse Discrete Cosine Transform of the filtered set of coefficients;

      scaling all the pixel values in the block as indicated by one parameter in the received  
film grain information; and

      storing the created block of film grain into a pool of film grain blocks.

1        5. The method according to claim 4 further comprising the step of performing an  
2 integer approximation of a Discrete Cosine Transform (DCT) and the Inverse Discrete  
3 Cosine Transform (IDCT) to reduce complexity.

1        6. The method according to claim 4 further comprising the step of scaling top  
2 and bottom edges of the created film grain block to hide block edges.

1        7. The method according to claim 4 wherein the step of receiving the film grain  
2 information further comprises the step of decoding a Supplemental Enhancement  
3 Information message containing the at least one parameter.

1        8. Apparatus for simulating film grain in an image block of  $M \times N$  pixels, where  
2  $N$  and  $M$  are integers greater than zero, comprising:

3            means for computing the average of the pixel values within the block of  $M \times N$   
4 pixels;

5            means for selecting a film grain block of  $M \times N$  pixels from among a pool of  
6 previously established blocks containing film grain as a function of the average value of the  
7 image block and a random number; and

8            means for blending each pixel in the selected film grain block with a corresponding  
9 pixel in the image block.

1        9. The apparatus according to claim 8 further a look up table containing random  
2 numbers to obtain the random number.

1        10. The method according to claim 9 where the look-up table is populated in  
2 advance of film grain simulation with random numbers generated by a random number  
3 generator.

11. An apparatus for creating a block of  $M \times N$  pixels with film grain, where  $N$   
and  $M$  are integers greater than zero, comprising:

means for receiving film grain information that includes at least one parameter that  
specifies an attribute of the film grain to appear in the block;

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means for creating a block of  $M \times N$  random values selected from a previously established list of Gaussian random numbers;

means for computing an Discrete Cosine Transform of the  $M \times N$  block of random numbers;

means for filtering the  $M \times N$  coefficients resulting from the Discrete Cosine Transform by at least one parameter in the received film grain information;

means for computing an Inverse Discrete Cosine Transform of the filtered set of coefficients;

means for scaling all the pixel values in the block as indicated by one parameter in the received film grain information; and

means for storing the created block of film grain into a pool of film grain blocks.

1        12.      The apparatus according to claim 11 further comprising means for performing  
2      an integer approximation of a Discrete Cosine Transform (DCT) and the Inverse Discrete  
3      Cosine Transform (IDCT) to reduce complexity.

1        13.      The apparatus according to claim 11 further comprising the means for scaling  
2      top and bottom edges of the created film grain block to hide block edges.

1        14.      The apparatus according to claim 11 wherein means for receiving the film  
2      grain information further comprises means for decoding a Supplemental Enhancement  
3      Information message containing the at least one parameter.

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